Film Growth Morphology and Segregation in Pulsed Laser Deposition

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Pulsed Laser Deposition is a promising thin film fabrication technique for the formation and integration of advanced materials. One of its principal advantages is that under some circumstances, which are poorly understood, very smooth films can be grown. In the first comparison of metal-on-insulator thin film growth morphology in Pulsed Laser Deposition (PLD) with conventional Thermal Deposition (TD) under otherwise identical conditions we have found that in both techniques, films advance through the same morphological progression: isolated three-dimensional **nanoparticles**, followed by impingement and coalescence into **elongated islands**, followed by percolation of the metal network and the subsequent filling of **holes** until a continuous film is attained. The rate at which this progression is traversed is a remarkably rich function of deposition conditions. It is anticipated that a fundamental understanding of this behavior will permit films to be fabricated using PLD that are either smoother or rougher than their TD-grown counterparts, and by predictable amounts.

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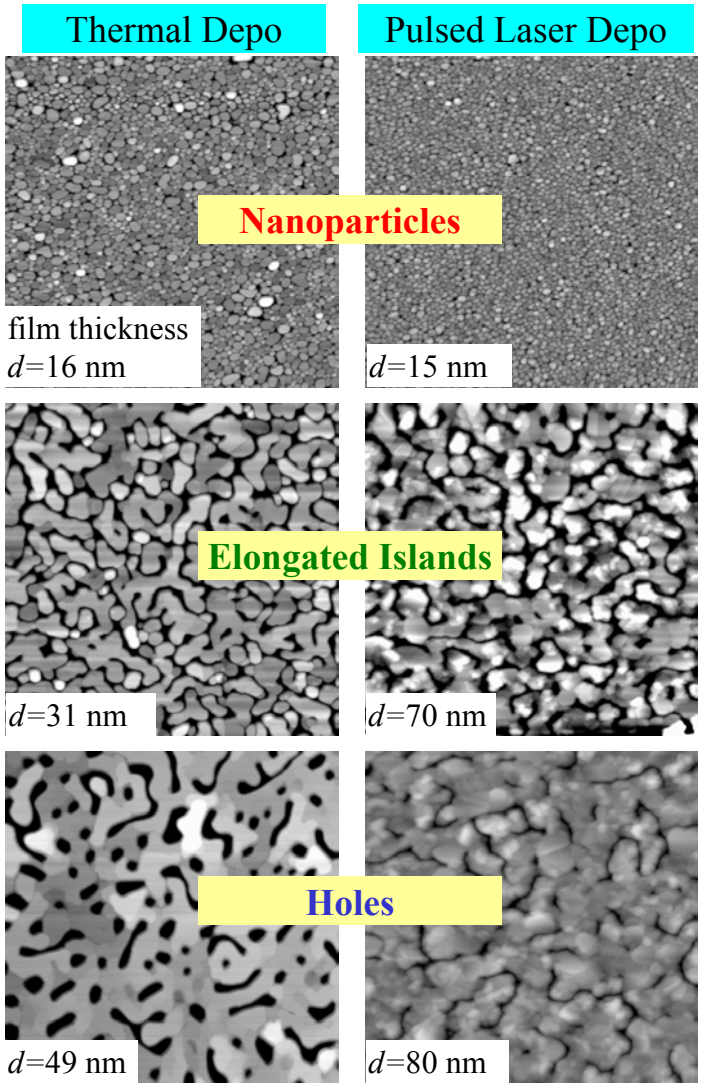

Film Growth Mechanisms in Pulsed Laser Deposition

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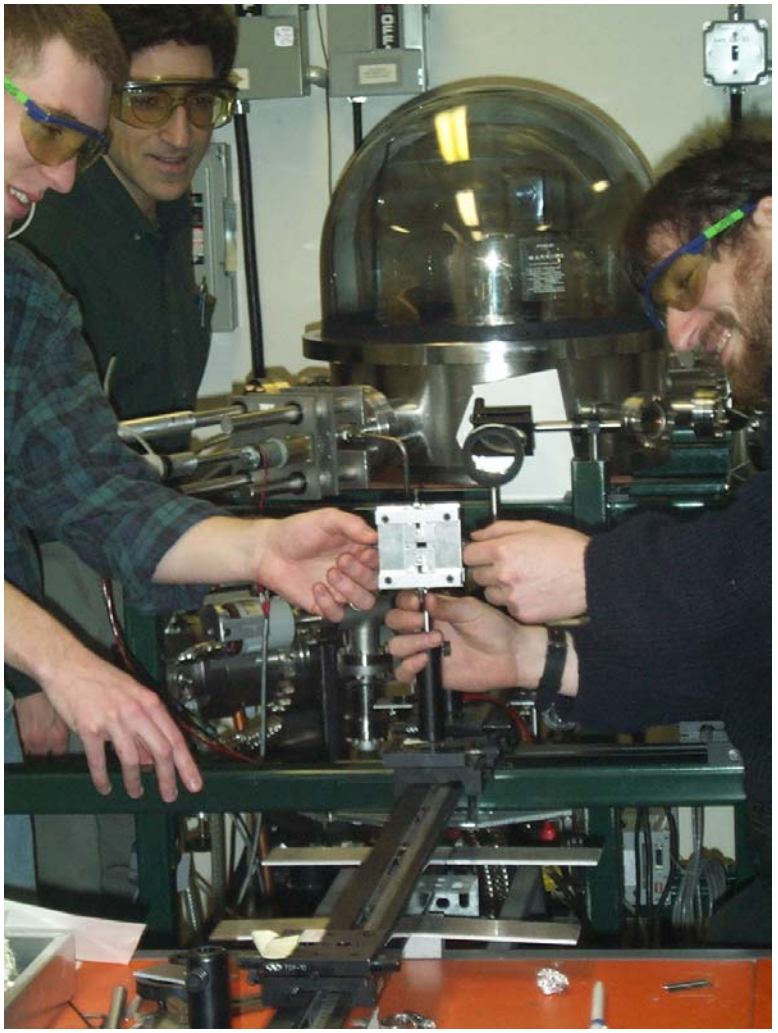
Education:

Supported the Ph.D. training of Dr. Craig Arnold (now on the Princeton faculty and training another generation of engineers), Jeffrey Warrender (still a student); and the postdoctoral training of Jorge Kittl (a minority U.S. citizen, now at Texas Instruments), Paul Sanders (now at Ford Motor Company), and John Leonard (now on the faculty at the University of Pittsburgh and training another generation of materials scientists).



Training tomorrow's teachers

The Principal Investigator is shown supervising the tuning of the laser beam path by graduate students Jeff Warrender (left) and Craig Arnold (right).